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CONTRIBUTIONS TO THE EUROPEAN POLLEN DATABASE

26. Valdeyernos, Toledo Mountains (central Spain)

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Site details

Valdeyernos bog (39° 26′ 28″ N, 4° 05′ 47″ W; 850 m above sea level (a.s.l.)) lies on the southern slope of the 'Sierra de Torneros' in the central part of the Toledo Mountains (Quintos de Mora Farm, Guadalerzas district, Los Yébenes, Toledo). The peat-bog extends over an area of 3.93 ha and it is a 'special protected habitat' in accordance with Law 9/1999 of Castilla-La Mancha on Nature Conservation. It was designated an 'environmental micro-reserve' in 2003 by the Decree 319/2003 (Martín-Herrero et al. 2004). The area experiences a Mediterranean climate with dry and warm summers, influenced by Atlantic winds from the southwest. The average annual temperature is 14–15 °C and the annual precipitation is 600–700 mm. The precipitation is irregular over the year with maximum values during winter (Perea & Perea 2008). The vegetation of the area is typically Mediterranean, a mixed forest of deciduous oaks *Quercus pyrenaica* Willd. and *Q. faginea* subsp. *broteroi* (Cout.) A.Camus, accompanied by *Acer monspessulanum* L., *Arbutus unedo* L., *Q. ilex* subsp. *ballota* (Desf.) Samp., *Sorbus torminalis* (L.), *Crataegus monogyna* Jacq., *Phillyrea angustifolia* L., *Erica arborea* L., *E. scoparia* L. and *Cistus populifolius* L. (Gómez-Manzaneque 1988; Baonza et al. 2010). The bog vegetation is composed mainly of *Sphagnum palustre* L., *Drosera rotundifolia* L., *Pinguicula lusitanica* L., *E. tetralix* L., *Calluna vulgaris* (L.) Hull and *Molinia caerulea* (L.) Moench (Velasco 1980; Martín-Herrero et al. 2004). The bedrock is an old siliceous basement made up mainly of sandstones, lutites and quartzites of Early Ordovician age (Muñoz-Jiménez 1976).

Sediment description

The profile is 50 cm deep and was collected from the central part of the bog in June 2006 by the last two authors using a Russian corer 5 cm in diameter. The composition was as follows:

0–14 cm: dark brown, partly decomposed *Sphagnum*-Cyperaceae peat with sand and gravels > 1 mm (Th2 Gmin3 Gmaj+ Dh1–10 YR 2/1)
14–34 cm: dark brown, decomposed *Sphagnum*-Cyperaceae peat with herbaceous and rather numerous wood fragments (Th2 Dh2 Dl1–10 YR 2/1)
34–50 cm: grey to olive silt with sand and gravels > 1 mm and macro-charcoal fragments (34–36, 39–43, 46–48 cm) (Ld1 Dh1 Dg1 Dl1 Gmaj2–5 YR 3/2)

Dating

Accelerator mass spectrometry (AMS) carbon-14 (^{14}C) dating was performed on bulk peat samples by the 'Centro Nacional de Aceleradores' (CNA, CSIC) in Sevilla (Spain). The calibration (2σ range) was performed using CALIB 6.0. and CALIBomb (with the calibration dataset NH zone 1) software (Stuiver & Reimer 1993; Hua & Barbetti 2004). Calibrated radiocarbon dates are given as cal BC or cal AD. Dating results are as follows:

14–15 cm: CNA 717, pM 101.27 ± 0.26 (cal AD 1953–1956)
29–30 cm: CNA 719, 95 ± 30 BP (cal AD 1683–1930)
40 cm: CNA 718, 515 ± 30 BP (cal AD 1326–1444)
48–50 cm: CNA 093, 2935 ± 33 BP (1261–1027 cal BC)

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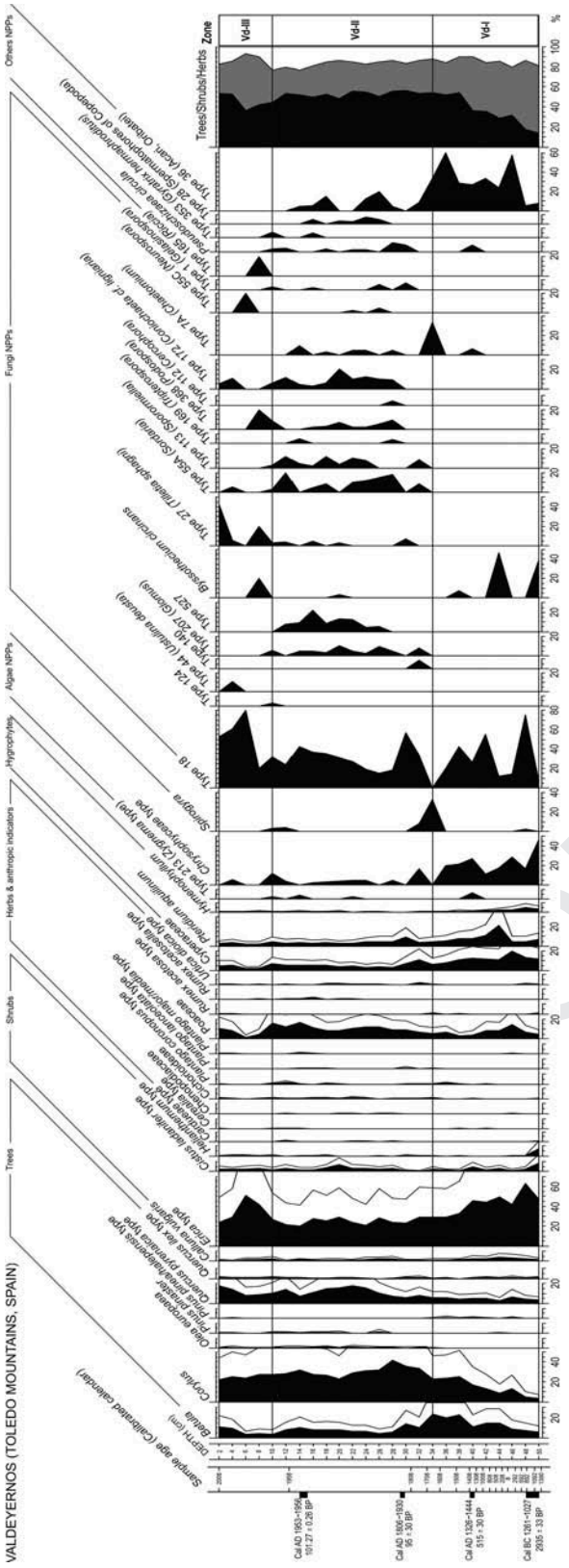

Figure 1. Pollen diagram from Valdeyernos bog (Toledo Mountains, central Spain). Selected pollen, spores of ferns and non-pollen palynomorphs (NPPs) taxa are represented. Hollow curves are exaggerated 2×.

Percent Modern (pM) is used to describe radiocarbon measurements for the past 45 years (http://www.radiocarbon.com/PDF/Beta-AMS-Methodology.pdf)

Interpretation

The core was sampled at 2 cm intervals. More than 500 terrestrial pollen grains were identified in each sample. The pollen sum (100%) includes all pollen grains except for hygrophytes and aquatic plants, spores of ferns and non-pollen palynomorphs (Figure 1). The arboreal vegetation comprised *Betula*, *Corylus* and both deciduous and evergreen *Quercus* throughout the entire sequence. This vegetation was quite different from the close by Patateros bog (Dorado-Valiño et al. 2014), where the arboreal vegetation is scarce during the same time period. The differences between the two pollen records could be due to fact that the Patateros bog is located on a northern slope and the Valdeyernos bog on a southern slope. Therefore, the Valdeyernos site was more affected by south-western Atlantic warm and humid winds than the ~~Papateros~~ site; the Valdeyernos bog is, furthermore, located in a little valley where drain streams lead to high edaphic humidity. Four pollen assemblage zones were defined using CONISS in TILIA® and TILIA-GRAPH® (Eric C. Grimm) computer programs:

VD-I (50–40 cm; c. 1300 cal BC–cal AD 1420)

The landscape is dominated by a shrub community composed of *Erica*-type accompanied by *Cistus ladanifer*-type, *Helianthemum*-type, *Calluna vulgaris* and Poaceae. The high values of *Erica*-type pollen could be an overrepresentation of local species as the bog is large. This vegetation also contained isolated stands of *Betula*, *Corylus* and both deciduous and evergreen *Quercus* with an undergrowth of ferns (*Pteridium aquilinum* (L.) Kuhn, *Hymenophyllum*). The presence of hygrophytes (Cyperaceae), freshwater algae (Chrysophyceae, *Spirogyra*) and ascospores of HdV-18 and *Byssothecium circinans* Fuckel suggests moist conditions and relatively high water tables (Van Geel & Aptroot 2006). The maximum percentage of HdV-18 (48 cm) can be correlated with the onset of the so-called 2.8 ka cal BP event (*c.* 850–760 cal BC; Van Geel et al. 1998), while minimum values (46–44 cm, *c.* 230 cal BC–cal AD 275) with an arid interval described in the Iberian Peninsula at this time (Martin-Puertas et al. 2008).

VD-II (40–34 cm; c. cal AD 1420–1665)

In this pollen zone, the previous landscape progressively changed to a vegetation dominated by *Betula*, *Corylus* and deciduous *Quercus*, although heathers are still abundant. The chronological boundaries of this zone

correlate well with the onset of the Little Ice Age, which, in Spain, was a cold interval with an initial dry phase, until cal AD 1550, and a later more humid one until the recent present (Manrique & Fernández-Cancio 2000). Towards the end of the pollen zone, a maximum of *Chaetomium* is detected coinciding with a level of macro-charcoals and the appearance of *Olea europaea* L.

VD-III (34–10 cm; c. cal AD 1665–1970)

Groups of birch and hazel were distributed along the periphery of the bog, while the slopes of the surrounding hills were covered by mixed oak forests (probably *Quercus pyrenaica* and *Q. faginea*). *Olea europaea* and evergreen *Quercus* are scarcely represented. The presence of *Pinus pinaster* Aiton pollen during the last century (the uppermost 28 cm) was contributed by planted trees (Gómez-Manzaneque 1988). The non-arboreal vegetation is mainly composed of *Erica*-type and Poaceae with a similar representation of *Calluna vulgaris* and *Cistus ladanifer*-type. This pollen zone is characterized by maximum values of dung-related fungal spores (*Sordaria*, *Sporormiella*, *Cercophora*, *Podospora*, *Tripterospora*, *Coniochaeta*), although the values of anthropozoogenous taxa (Chenopodiaceae, *Plantago lanceolata*-type, *Plantago major/Plantago media*-type, *Urtica dioica*-type) are relatively low, suggesting local grazing (López-Sáez & López-Merino 2007). Weak human impact is suggested by the continuous presence of anthropogenic pollen indicators (Cardueae, Cichorioideae, *Rumex acetosella*-type). Erosive processes are reflected by the presence of *Glomus*, *Pseudoschizaea circula* (Wolff) Christopher and *Entorrhiza*. The progressive decline of *Betula*, hygrophytes, freshwater algae and *Byssothecium circinans* suggests initial drier conditions, which could favour the peat-bog formation at 34 cm, as shown by the sedimentary description and the continuous presence of *Tilletia sphagni* Navashin. Two maximum peaks for HdV-18 indicate wet phases (Mighall et al. 2006), while minimum values at 34 cm (cal AD 1665) and 28–24 cm (cal AD 1873–1895) can be correlated with two severe drought episodes reconstructed from rogation ceremonies recorded at the Toledo Cathedral (Domínguez-Castro et al. 2008).

VD-IV (10–2 cm; c. cal AD 1970–2006)

The landscape is almost the same as in the previous pollen zone but with a greater representation of *Erica*-type and a general decrease of coprophilous fungi.

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